Primality's Unwinding Nature: Drawing upon the Identity Tweak

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ABSTRACT[1]

It can and has been shown copiously that the nature of prime numbers could be viewed as recursive, Diophantine, self-spawned. Incidentally, it proves even simpler than that: Per any number prime, so likewise is either the sum or the difference of its 'tweak' characteristics.

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Introduction as Reminder

Dub it "digital roots" at liberty, I have long developed its extensions and applications independently as an apparatus I refer to as *"#-scoring*" or "*alethe-calculus*." Shevenyonov (2022) suggests how primes could be rationalized somewhat as a Fibonacci-like sequence based on the #-scores alone.

At this point, I deploy *both* the "tweak characteristics," namely **#** *and* **X**, in arriving at a remarkable meta-regularity, or indeed a pattern elucidating the nature of primality. Just to remind you, in line with *orduale* principles (notably the identity-based approach, fudge calibration, or what is known elsewhere as 'tweaking'), any natural number can be reconsidered as follows:

$$\forall A \in \boldsymbol{N}\ \exists X \in \boldsymbol{N}\colon\ A \equiv \# + 9X \equiv \#^{X}A + 9X \equiv (\#, X), \qquad \# = \overline{0{,}8}\ iff\ X \equiv X_{max}$$

In a sense, then, the natural axis could thereby be *compactified* toward a cyclic manifold whereby indefinitely many numbers end up having the same #-scores, their X-metric set aside. However, the latter taken into account, each number can be represented uniquely. I leave this without proof for future research that may be shared shortly, while for now focusing on the core implication for primes as a subset of [prime] interest.

Somewhat informally, # fares as the 'numerological' sum under 9, with X thus accounting for a maximum applicable fudge-value unless *interim* scoring applies. (Strictly speaking, as a *complete residuale*, X amounts to the 'floor' function of A/9.)

[1] To those taking the liberty of staying responsible rather than power-maximizing

Experimental Demonstration

Consider how the first primes spanning 11 through 103 are rethought via their conjugate characteristics. E.g. 11=2+9*1=(2,1), 13=(4,1), 19=(1,2), 23=(5,2), 29=(2,3), 31=(4,3), 37=(1,4), 41=(5,4), 43=(7,4), 47=(2,5), 53=(8,5), 59=(5,6), 67=(4,7), 71=(8,7), 73=(1,8), 79=(7,8), 83=(2,9), 89=(8,9), 97=(7,10), 101=(2,11), 103=(4,11), etc. A conjecture is proposed:

Conjecture: *For any prime number, [the absolute value of] either a sum (X+#) or a difference (X-#) of its tweak characteristics proves to be prime (or 1), or both. The latter (i.e. difference) applies/befits whenever the former option proves 0 mod3^k, unless such is X alone*.

Please check for yourselves if the above 'fork' holds. To demonstrate the latter scenario, consider candidate primes as diverse as, 71=(8,7), 73=(1,8), 79=(7,8), 103=(4,11), 119=(2,13), 127=(1,14), etc. All of these instances feature either 3 or $9=3^2$ dividing the respective sums (X+#). In contrast, the differences (or their absolute values) showcase primality (unitarian included).

In fact, one may want to tap into values as large as, 613=(1,68) (obviously 68+1=69 is divisible by 3, 68-1=67 being prime) or 2887=(7, 320) (with 320+7 all too evidently 0 modulo 3, at odds with 320-7=313 boasting primality). Values such as 4057=(7,450) stand out on the strength of their X being divisible by 3 and 9 in its own right, albeit without disabling either the sum criterion or the difference cut-off: X-#=450-7=443, X+#=450+7=457 (both standing primality). Notably, 137=(2,15) is one other case in point allowing both.

By contrast, it may appear that *composites* fail the test in showing a recurringly composite nature even in their resultant metrics, oftentimes 0 modulo 3^k (3k) or 5^k (5k). (Not necessarily so!) For instance, 161=7*23=(8,17), such that X+#=25, X-#=9. Likewise, $169=13^2$=(7, 18). While the difference criterion formally works in the latter case, it does so not due to the sum being disabled by 3-divisibility, even though 5-division applies above and beyond 9-divisibility of X.

It remains to be seen, however, and could alone be posed as a conjecture, whether the instance of #=7 has inflicted the bulk of the extra verification burden throughout. For example, 2851=(7, 316) denies validity to the difference yet not the sum. Whichever is the easier to check may be reasonable to start off with.

Qualifying

On second thought, composites such as 221=13*17=(5,24) remain a dire challenge as they pass both the characteristic-primality tests other than X [not] 0 modulo 3. In this respect, '*holes*' like this are substantively indifferent from strong primes, notably the selfsame 137. It may be worth the effort attempting a weaker joint characteristic, e.g. (#, #X). Alternatively, the 'gray area' in between [primes versus composites] might point to an *onto/if* (sufficiency) nature of the above conjecture but not one-to-one/only-if (necessity). Otherwise, given that similar *bi*focality applies to 129=3*43=(3,14) but not power composites like $361=19^2$=(1,40) may suggest singular composition acting as if to deny *equi*potence (i.e. 'both' as opposed to '[n]either' scenario).

References

Shevenyonov, Arthur V. (2022). Unconventional if[f] Convenient: Effective Structures to Construct Alternate Primes Experimentally. *viXra: 2202.0047*